



## EFFECT OF DASANASAMSKARA CHOORNA FOR DANTADHAVANA IN ORAL HYGIENE

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### ABSTRACT

Oral hygiene is the practice of keeping the mouth and teeth clean to prevent dental problems. Global burden of disease estimates 69% of population with oral diseases. This study ventures at the use of *Dasanasamskara choorna* in *Bhaishajyaratnavali* for *dantadhavana* and its effect in oral hygiene based on Oral Hygiene Index – Simplified score and microbiological examinations. Calcium carbonate, the most common mild abrasives used by modern dentists is the major ingredient of this research medicine in the form of *khatika choorna*. Other ingredients *sunthi*, *haritaki*, *musta*, *khadira*, *ghanasara*, *guvaka bhasma*, *marica*, *devapuspa*, *tvak* are also effective in prevention of teeth diseases as per classics and researches.

The study was non randomized control trail, conducted in 40 volunteers in age group 18-45 years. 20 consented volunteers with OHI-S poor and fair were selected in study group and 20 volunteers with OHI-S poor and fair were selected in control group using consecutive sampling technique. 5 volunteers were selected by lottery method and their saliva were taken and sent for microbiological examinations (total bacteria count and Streptococcus mutans count). For the study group, *Dasanasamskara choorna* was given and for the control group particular toothpaste accepted by Indian Dental Association was provided. Both groups were advised to do regular brushing for 2 minutes twice a day for one month. OHI-S of 40 volunteers was assessed on 0th, 15th & 31st day. Microbiological examinations of 5 volunteers selected by lottery method from both groups taken were repeatedly done on 0th, 15th, 31st days. The results were analyzed statistically within groups considering the outcome variables OHI-S and microbiological examination of saliva using Wilcoxon signed rank test and between groups using Mann-Whitney Test. This study is significantly effective in improving oral hygiene.

**KEYWORDS:** *Dasanasamskara choorna*, *dantadhavana*, oral hygiene.

### INTRODUCTION:

*Ayurveda* has a rich reservoir for dental sciences and has mentioned various procedures for maintaining oral hygiene like *dantadhavana*, *gandusha*, *kabala* and *jihwanirlekhana*. *Dantadhavana* -cleaning of teeth is the main procedure for oral hygiene.

Oral hygiene is the practice of keeping the mouth and teeth clean to prevent dental problems i.e. most commonly dental cavities, gingivitis, periodontal (gum) diseases and bad breath<sup>1</sup>. Dental diseases are a significant public health burden in India as well as across the globe. WHO recognizes oral health as an integral part of general health. The consequences of widespread poor oral health can be seen on both personal and community levels as dental caries and periodontal disease deteriorate the individual health and wellbeing, decrease economic productivity<sup>2</sup>. Over the past decade a growing body of scientific evidence seems to suggest a significant association between periodontal infections and systemic conditions like coronary heart disease, respiratory infections, preterm low birth weight babies etc<sup>3</sup>.

Estimates from Global Burden of Disease demonstrate that oral diseases affect 3.9 billion people and covering about 69% of the population. Prevalence of oral diseases is very high in India with dental caries 50%, 52.5%, 61.4%, 79.2% and 84.7% in 5 years, 12 years, 15 years, 35–44 years and 65–74 years respectively and periodontal diseases 55.4%, 89.2% and 79.4% in 12 years, 35–44 years and 65–74 years respectively as the two most common oral diseases<sup>4</sup>.

Most of the dental diseases permanently destroy the tissues which cannot be repaired and replaced by the body<sup>5</sup>. Treatments of dental diseases are very expensive and time consuming. The food sticking to the dental crevice serves as a good medium for bacterial growth. So oral hygiene is inevitable in the control of oral diseases.

Various compounds such as fluorides, detergents, abrasives, dyes, calcium and agents for taste are present in a tooth paste<sup>6</sup>. Swallowing too much fluoride from toothpaste potentially causes fluorosis, stomach ailments, acute toxicity, skin rashes, and impairment in glucose metabolism. Other chemicals ingested from toothpastes can cause toxic effect on teeth, bones, blood, muscles, nerves and other parts of the body<sup>7</sup>. Considering the increasing prevalence of antibiotic resistance due to their use and also their side effects, medicinal plants are now considered for use against bacterial infections and effective in with dental problems.

Typical toothpaste constitutes at least 50% of abrasive, which removes food debris and stains from teeth. Calcium carbonate is the most common mild abra-

sive in practice. *Dasanasamskara choorna* in *Bhaishajyaratnavali* written in 18<sup>th</sup> century contains calcium carbonate as major ingredient in the form of *khatika choorna*. Anti-bacterial effect of calcium carbonate nanoparticles has been scientifically proved<sup>8</sup>. The anti-bacterial activity of medicinal plants is due to the presence of potential bioactive compounds, which help to reduce bacterial load in the oral cavity and thus prevent the formation of plaque, dental caries and ulcers. With this background the present study ventures at the use of *Dasanasamskara choorna* for *dantadhavana* and to find out its effect in oral hygiene.

### OBJECTIVES OF THE STUDY:

1. To assess the effect of *dantadhavana* with *Dasanasamskara choorna* in OHI – S score.
2. To assess the effect of *dantadhavana* with *Dasanasamskara choorna* on oral micro flora (Total bacteria count, streptococcus mutants count)

### MATERIALS AND METHODS:

#### Study setting:

OPD of Department of *Swasthavritta*, Government Ayurveda College, Thiruvananthapuram.

#### Study population:

Volunteers registering in OPD of *Swasthavritta* with OHI-S poor (1.3-3.0) and fair (3.0-6.0)

#### Inclusion criteria:

1. Age group 18-45 years
2. Both sexes
3. Those who are willing to participate in the study

#### Exclusion criteria

- Volunteers with
1. Mouth ulcers, gingivitis and periodontitis
  2. Good Oral Hygiene Index-S score (0-1.2)
  3. Dental braces
  4. Any other known systemic diseases

**Sample size:**

40 (20 study group and 20 control group)

**Study design:**

Primary objective-Non randomized control trial

Secondary objective-Simple random sampling- Lottery method

**Sampling technique:**

40 volunteers selected from the study setting as per inclusion and exclusion criteria using consecutive sampling.

**Data collection:**

1. Oral Hygiene Index score-S (Green and Vermillion)
2. Microbiological examination of saliva
3. Case proforma

**Study tool**

1. OHI-S score (Green and Vermillion)
2. Microbiological examination of saliva

**Ingredients and method of preparation of Dasanasamskara choorna:**

Ingredients-Sunthi (*Zingiber officinale*), Haritaki (*Terminalia chebula*), Musta (*Cypripedium rotundus*), Khadira (*Acacia catechu*), Ghanasara (*Cinnamomum camphora*), Guvaka bhasma (*Areca catechu*), Marica (*Piper nigrum*), Devapuspa (*Syzygium aromaticum*), Tvaka (*Cinnamomum verum*), Khatika choorna (limestone/calcium carbonate). 200g each of sunthi, haritaki, musta, khadira, ghanasara/ karpura, guvaka bhasma, marica, devapuspa, tvak and 1800 gm of khatika choorna was used for the preparation. Guvaka bhasma was prepared by one puta under 700°Celsius for 6 hours. Khatika was taken in a stainless-steel vessel and added enough quantity of clean water, macerated and filtered. The wet powder obtained was spread on steel plate and dried under sun till the powder gets dried. It was then sieved well and the powder is stored in a separate air tight container. All the powdered drugs were taken in equal quantity (200gm) except khatika choorna which is taken 9 times (1800gm) and all the ingredients mixed well. The prepared Dasanasamskara choorna was stored in a large air tight bottle and it was then packed in 100g air tight bottles for drug dispense.

**Drug dispense and application of medicine:**

For the study group, 100g of Dasanasamskara choorna was given in an air tight bottle for 15 days and are advised to do regular brushing with 3g of Dasanasamskara choorna using a soft tooth brush during morning and evening for 2 minutes followed by tongue cleaning. For the control group 100 g of particular toothpaste accepted by Indian Dental Association was provided for 15 days and asked to do brushing similarly. On 15<sup>th</sup> day, again same procedures were repeated. Both of the groups are and asked to continue regular brushing as advised above for the next 15 days.

**Collection of saliva samples:**

Saliva was collected in containers (sterile) 30 ml size on zeroth day, 15<sup>th</sup> day and on 31<sup>st</sup> day.

**Assessment of total bacterial count and streptococcus mutans count:**

The method used for assessing the total bacterial count and streptococcus mutans count was Quantitative method. The saliva samples were inoculated into Mutas-sanguis agar plate in two ways-1:10 dilution & 1:100 dilution method.

**Assessment of study**

OHI-S of 40 volunteers was assessed on 0<sup>th</sup>, 15<sup>th</sup> and 31<sup>st</sup> days. Microbiological examination (total bacteria count, Streptococcus mutans count) of saliva of 5 volunteers selected by lottery method from both groups was repeatedly done on 0<sup>th</sup>, 15<sup>th</sup> and 31<sup>st</sup> day. The results were analyzed statistically with regards to changes in OHI-S and microbiological examination of saliva.

**Outcome variables:**

1. Change in OHI-S
2. Changes in microbiological examination of saliva (Total bacteria count and Streptococcus mutans count)

**Statistical analysis:**

Descriptive statistics such as frequencies and percentages are determined in the case of socio-demographic data, clinical features of the condition, data before and after intervention in order to get a basic idea about their distribution. For the three study variables OHI-S, total bacteria count, Streptococcus mutans count, at first the normality assumption of the data distribution was tested using Kolmogorov-Smirnov test. Since the data showed that the distribution of all study variables were non-normal, non-parametric statistical methods were used for analyzing the data. The effect of research medicine with in groups was assessed using Wilcoxon signed rank test. Mann-Whitney Test was employed for between groups comparison based on study variables. The results were presented

as median (range for each variable). A calculated value less than 0.05 is considered to be statistically significant. All the analysis was done with the help of software SPSS Version 22.0.

**Ethical consideration:**

No known side effects and toxicity for the proposed study medicine. Textual evidence supporting the therapeutic use is available. Certificate of consent from patients will be obtained prior to the study.

**RESULTS:****1. OHI-S Score:**

**Table No. 1: Data and test of significance for the comparison of control and study groups based on percentage loss in OHI-S Score**

Group	Median Range	Stage	p
Study Control	15.98 (0.00-45.00) 0.00 (-7.52-18.03)	0 <sup>th</sup> day-15 <sup>th</sup> day	0.000*
Study Control	14.73 (.00-33.50) 0.00 (0.00-18.80)	15 <sup>th</sup> day-31 <sup>st</sup> day	0.000*
Study Control	31.82 (0.00-50.21) 7.58 (-7.52-22.86)	0 <sup>th</sup> day-31 <sup>st</sup> day	0.000*

\*Significant (p<0.05)

As per table 1, in study group and control group the intervention has significant effect on OHI-S during 0<sup>th</sup> day to 15<sup>th</sup> day (p<0.05), 15<sup>th</sup> day to 31<sup>st</sup> day (p<0.05) and 0<sup>th</sup> to 31<sup>st</sup> day (p<0.05). During 0<sup>th</sup> day to 15<sup>th</sup> day, 15<sup>th</sup> day to 31<sup>st</sup> day and 0<sup>th</sup> to 31<sup>st</sup> day study group reported significantly higher level of percentage loss as compared to control group regarding OHI-S.

**2. Total Bacterial Count:**

**Table No. 2: Data and test of significance for the comparison of control and study groups based on percentage loss in total bacteria count**

Group	Median Range	p	Stage
Study Control	91.1905×10 <sup>5</sup> (8.57×10 <sup>5</sup> -94.03×10 <sup>5</sup> ) -5.0000×10 <sup>5</sup> (-26.83×10 <sup>5</sup> - 4.76×10 <sup>5</sup> )	0.008*	0 <sup>th</sup> day-15 <sup>th</sup> day
Study Control	87.5000×10 <sup>5</sup> (37.00×10 <sup>5</sup> -94.62×10 <sup>5</sup> ) 12.5000×10 <sup>5</sup> (-73.08×10 <sup>5</sup> -16.67×10 <sup>5</sup> )	0.008*	15 <sup>th</sup> day-31 <sup>st</sup> day
Study Control	98.5366×10 <sup>5</sup> (88.57×10 <sup>5</sup> -99.51×10 <sup>5</sup> ) 0.0000×10 <sup>5</sup> (-119.51×10 <sup>5</sup> -16.67×10 <sup>5</sup> )	0.008*	0 <sup>th</sup> day-31 <sup>st</sup> day

\*Significant (p<0.05)

As per table 2, in the study group, the intervention has significant effect on total bacteria count during 0<sup>th</sup> day to 15<sup>th</sup> day (p<0.05), 15<sup>th</sup> day to 31<sup>st</sup> day (p<0.05) and 0<sup>th</sup> to 31<sup>st</sup> day (p<0.05). The control group has no statistical significant effect on total bacteria count during 0<sup>th</sup> day to 15<sup>th</sup> day (p>0.05), 15<sup>th</sup> to 31<sup>st</sup> day (p>0.05) and 0<sup>th</sup> to 31<sup>st</sup> day (p>0.05). During 0<sup>th</sup> -15<sup>th</sup> day, 15<sup>th</sup> -31<sup>st</sup> day, 0<sup>th</sup> day-31<sup>st</sup> day study group reported significantly higher level of percentage loss as compared to control group regarding total bacteria count.

**3. Streptococcus Mutans:**

**Table No. 3: Data and test of significance for the comparison of control and study groups based on percentage loss Streptococcus mutans count**

Group	Median Range	Stage	p
Study Control	90.75×10 <sup>5</sup> (64.77×10 <sup>5</sup> - 97.41×10 <sup>5</sup> ) 6.25×10 <sup>5</sup> (-2.50×10 <sup>5</sup> -35.14×10 <sup>5</sup> )	0 <sup>th</sup> day-15 <sup>th</sup> day	0.008*
Study Control	28.14×10 <sup>5</sup> (6.25×10 <sup>5</sup> -59.38×10 <sup>5</sup> ) 21.95×10 <sup>5</sup> (-40×10 <sup>5</sup> -95.00×10 <sup>5</sup> )	15 <sup>th</sup> day-31 <sup>st</sup> day	0.548 NS
Study Control	91.34×10 <sup>5</sup> (84.09×10 <sup>5</sup> -97.65×10 <sup>5</sup> ) 49.86×10 <sup>5</sup> (0.00×10 <sup>5</sup> -95×10 <sup>5</sup> )	0 <sup>th</sup> day-31 <sup>st</sup> day	0.222 NS

\*Significant (p<0.05)

NS: Not significant (p>0.05)

In the study group, the intervention has significant effect on streptococcus mutans count during 0<sup>th</sup> day to 15<sup>th</sup> day (p<0.05), 15<sup>th</sup> day to 31<sup>st</sup> day (p<0.05) and 0<sup>th</sup> to 31<sup>st</sup> day (p<0.05). In the control group, the intervention has no statistical significance on average streptococcus mutans count during 0<sup>th</sup> day to 15<sup>th</sup> day (p>0.05), 15<sup>th</sup> day to 31<sup>st</sup> day (p>0.05) and 0<sup>th</sup> to 31<sup>st</sup> day (p>0.05).

As per table 3, there exist significant percentage loss in streptococcus mutans count between control and study group during 0<sup>th</sup> day-15<sup>th</sup> day (p<0.05). Between 15<sup>th</sup> -31<sup>st</sup> day and during 0<sup>th</sup> day-31<sup>st</sup> day also there do not exist significant percentage loss (p>0.05) between control and study groups. Even though the percentage loss is statistically insignificant, there is an observed reduction of loss in Streptococcus mutans count between control and study groups from 15<sup>th</sup> to 31<sup>st</sup> day and 0<sup>th</sup> to 31<sup>st</sup> day of sample.

**DISCUSSION:**

Oral disorders can significantly affect the general well-being of a person by causing pain and discomfort thus affecting the quality of life. Maintaining a clean mouth benefits overall health. Despite several chemical agents being commercially available, these can alter oral micro biota and have undesirable side-effects such as vomiting, diarrhoea and tooth staining.

*Ayurveda* has been shown effective in maintaining oral health. Preventive dentistry is the practice of caring teeth to keep them healthy. The preventive practices of *Ayurveda* for maintaining oral hygiene are noteworthy. The present study aims to assess the effect of one such procedure of *dinacharya-dantadhavana* with *Dasanasamkara choorna* in oral hygiene.

In the study group, 60% of the volunteers use excessive sweets. In the control group, 55 % of the volunteers use excessive sweets. Sugar is like a magnet for bad bacteria. The two destructive bacteria found in the mouth are streptococcus mutans and streptococcus sorbins. Both of these bacteria feed on the sugar and form dental plaque. If the plaque is not washed away by saliva or brushing, the environment in the mouth becomes more acidic and cavities may start to form. In the study group, 70% of volunteers had bad breath. In the control group, 45% of volunteers had bad breath. Improper oral hygiene practices leads to bad breath as the food particles remain in mouth. In the study group, 50% of volunteers were having dental caries, 70% of volunteers from control group were having dental caries. Efficient oral hygiene was found to have a caries preventive effect. Dental caries is one of the most common infectious diseases affecting the oral cavity. Among the oral bacteria, streptococcus mutans have been indicated as major cariogenic bacteria as they produce high levels of dental caries causing substances such as lactic acid and extracellular polysaccharides.

- 1. OHI-S Score:** Study group and control group has significant effect on OHI-S during 0<sup>th</sup> day to 15<sup>th</sup> day (p<0.05), 15<sup>th</sup> day to 31<sup>st</sup> day (p<0.05) and 0<sup>th</sup> to 31<sup>st</sup> day (p<0.05). During 0<sup>th</sup> day to 15<sup>th</sup> day, 15<sup>th</sup> day to 31<sup>st</sup> day and 0<sup>th</sup> to 31<sup>st</sup> day study group reported significantly higher level of percentage loss as compared to control group regarding OHI-S. Thus, effect of *Dasanasamkara choorna* is more significant in oral hygiene considering OHI-S score.
- 2. Total Bacterial Count:** In the study group, the intervention has significant effect on total bacteria count during 0<sup>th</sup> day to 15<sup>th</sup> day, 15<sup>th</sup> day to 31<sup>st</sup> day and 0<sup>th</sup> to 31<sup>st</sup> day. The control group has no statistical significant effect on total bacteria count during 0<sup>th</sup> day to 15<sup>th</sup> day, 15<sup>th</sup> to 31<sup>st</sup> day and 0<sup>th</sup> to 31<sup>st</sup> day. There exist significant percentage loss in total bacterial count between control and study group during 0<sup>th</sup> day-15<sup>th</sup> day (p<0.05), 15<sup>th</sup>-31<sup>st</sup> day (p<0.05) and during 15<sup>th</sup> day-31<sup>st</sup> day (p<0.05). During 0<sup>th</sup>-15<sup>th</sup> day, 15<sup>th</sup>-31<sup>st</sup> day, 0<sup>th</sup> day-31<sup>st</sup> day study group reported significantly higher level of percentage loss as compared to control group. Thus, effect of *Dasanasamkara choorna* is more significant in reducing the total bacterial count in study group.
- 3. Streptococcus Mutans:** In the study group, the intervention has significant effect on streptococcus mutans count during 0<sup>th</sup> day to 15<sup>th</sup> day (p<0.05), 15<sup>th</sup> day to 31<sup>st</sup> day (p<0.05) and 0<sup>th</sup> to 31<sup>st</sup> day (p<0.05). In the control group, the intervention has no statistical significance on average streptococcus mutans count during 0<sup>th</sup> day to 15<sup>th</sup> day (p>0.05), 15<sup>th</sup> day to 31<sup>st</sup> day (p>0.05) and 0<sup>th</sup> to 31<sup>st</sup> day (p>0.05).

There exist significant percentage loss in streptococcus mutans count between control and study group during 0<sup>th</sup> day-15<sup>th</sup> day (p<0.05). Between 15<sup>th</sup>-31<sup>st</sup> day and during 0<sup>th</sup> day-31<sup>st</sup> day also there do not exist significant percentage loss (p>0.05) between control and study groups. Even though the percentage loss is statistically insignificant, there is an observed reduction of loss in Streptococcus mutans count between control and study groups from 15<sup>th</sup> to 31<sup>st</sup> day and 0<sup>th</sup> to 31<sup>st</sup> day sample.

**PROBABLE MODE OF ACTION OF DASANASAMKARA CHOORNA**

Mode of action of *Dasanasamkara choorna* can be correlated with the *rasapanchaka*, *dosha karma*, *vyadhihara* properties of the ingredients.

*Sunthi* is *katu rasa*, *guru*, *ruksha*, *tikshnaguna*, *madhura vipaka* and *vathakaphahara* in *dosha karma*. It is *mukharogagni*, *ruchya* and *krimidoshahara*. Anti-inflammatory, anti-bacterial, action of *shundi* is proven by studies. Evidences from in vitro, animal, and epidemiological studies suggest that ginger and its active constituents suppress the growth and induce apoptosis of variety of cancer types including oral cancer. *Zingiber officinale* extract has significant anti-microbial effects on S.mutans. *Sunthi* contain calcium and phosphorous which may also help in dental health.

*Haritaki* is *pancharasa* in *rasa*, *kashaya rasa* mainly. *Guru*, *tikshna*, *ushnaveerya*, *madhuravipaka*, *tridoshahara* in *dosha karma*. It is *krimihara*. It is one of the ingredients of *triphalā*, which seems to full fill most of the requirements without any adverse effect on oral tissues and at very minimal cost. Ethanol extracts of *Terminalia chebula* proved to prevent periodontal disease induced by dental plaque bacteria. An aqueous extract of T. chebula used as a mouth rinse seems to be an effective anticaries agent. Anti-inflammatory, antimicrobial properties are proved by studies. Previous studies prove that *haritaki* is effective

anticaries mouth wash, owing to its ability to increase salivary pH and inhibit the growth of Streptococcus mutans.

*Musta* is of *tiktha*, *katu*, *kashaya rasa*, *laghu*, *rukshaguna*, *seethavirya*, *katuvipaka* and *kaphapitta hara* in *dosha karma*. It has specific action on *aruchi*, *krimi*. It is *janthujith* according to *kayyadevanigandu*, *janthuhrit* according to *Bhavaprakasha*. It is anti-inflammatory, anti-microbial. *Cyperus rotundus* alcoholic extract had the greatest effect on inhibition of growth and death of Streptococcus mutans. It is suitable for the treatment and prevention of periodontitis and tooth decay.

*Khadira* is *tiktha* *kashaya rasa*, *laghu*, *rookshaguna*, *seethavirya* and *katuvipaka*. *Kapha-pitta hara* in *dosha karma*. *Khadira* is used for *dantadhavana* according to *Charaka* and *Vagbhata*. It has action on *kusta*, *krimi*, *kandu*, *vra*. It is *sothahara* and *sleshmahara* in *karma*. It has *bhoothahara* action according to *Raja nigandu*. Antiseptic, anti-inflammatory, anti-microbial actions of *khadira* are proved by studies. It is tonic and useful in ulcers and wounds, inflammations, odontopathy, pharyngodynia. *Acacia catechu* bark extract have got good anti-microbial activity against streptococcus mutans.

*Karpura* is *tikta*, *katu*, *madhura rasa*, *rukshaguna*, *seethavirya*, *katuvipaka* and *kaphahara* in *dosha karma*. It is *aasyavairasyahara* according to *Bhavaprakasa* and *dourgandhyahara* according to *Bhavaprakasa* and *Charaka samhitha*. It is *kustahara*, *krimihara*, *vranahara* and possess *lekhana* property. Antiseptic, anti-microbial and anti-inflammatory is proven by studies. The extract acts as a good source of antimicrobial agent against various bacterial pathogens and exhibited broad spectrum of antibacterial activity. *Cinnamomum camphora* significantly inhibit the growth of oral microbes, leading to healthy gums and fresh breath.

*Guvaka* is *kashaya madhura rasa*, *guru*, *ruksha*, *vikashiguna*, *seethavirya*, *katuvipaka*, *kaphapitta hara*. It is *ruchya*, *aasyavairasyanaasanam*. *Guvaka* (betel-nut) is cooling and a nerve tonic. Chewing of its nuts prevents decay of teeth. It was used in this formulation as *bhasma* form. *Bhasma* are unique Ayurvedic preparation which means an ash obtained through incineration. These neutralize harmful acids that lead to illness. Achieve a healthy alkaline level by neutralizing acid. *Guvaka bhasma* contains carbon particles which is a good cleaning agent. Further researches on charcoal ashes showed that it is helpful in changing the pH and health of the mouth, and as such is effective in preventing cavities and killing the bad bacteria present in tooth decay and gingivitis.

*Marica* is *katu rasa*, *laghu*, *rukshaguna*, *ushnavirya*, *katuvipaka* and *kaphavataharāin doshakarma*. It possess *krimihara* property. It is *ruchikara* (RN), *janthunasana* and *bhoothanasana* (RN). It possess *chedana* (SN) property. Its antioxidant, anti-inflammatory and anti-microbial properties are proven by studies.

*Devapuspa/lavanga* is *tiktha*, *katu rasa*, *laghu*, *snigdaguna*, *seta virya*, *katuvipaka* and *kaphavatahara* in *dosha karma*. It is *soolahara* and *peenasaahara*. Its antibacterial action is proven by studies. It is useful in halitosis, odontalgia, burning sensation, and dental caries. *Syzygium aromaticum* is anti-microbial, anti-fungal, and antioxidant. Research did on the phytochemical properties of *Syzygium aromaticum* have action against oral microorganisms like streptococcus mutans. Clove oil also possesses bacterial effects on dental carries and gingivitis.

*Tvak* is of *katu*, *tikta* and *madhura rasa*, *laghu*, *rooksha*, *tikshnaguna*, *ushnavirya* and *katuvipaka*. *Vatapitta hara* in *dosha karma*. It is beneficial in *kusta* and *kandu*. It possesses specific action on *peenasa*. It increases *annabhiruchi*. *Cinnamomum verum* is useful in odontalgia, halitosis, inflammations etc. Its antibacterial effect on oral bacteria has been reported. It also increases the salivary flow which aids in cleaning the oral cavity. Cinnamic aldehyde is famous for its ability to impede the action of Streptococcus mutans, thereby resulting in an effective prevention of dental caries.

*Khatika choorna* (calcium carbonate) is of *tikta* *madhura rasa*, *seethaguna*, *seethaveerya*, *pitta hara* in *dosha karma*. *Sothahara*, *vranaropaka*, *dahahara* are the properties of *khatikachoorna*. It chemically contains CaCO<sub>3</sub>, which removes food debris and stains from teeth. It is anti-inflammatory and has cleansing property. Anti-bacterial effect of calcium carbonate nano particles has been scientifically proved. It re-mineralizes the tooth surface.

*Sunthi*, *marica*, *musta*, *karpura*, *devapuspa*, *tvak* possess *katu rasa*. *Musta*, *khadira*, *devapuspa*, *tvak* and *khatika choorna* possesses *tiktha rasa*. *Guvaka bhasma*, *khadira* are of *kashaya rasa*. *Haritaki* is of *pancharasa* dominant of *kashaya rasa*. *Ghanasara*, *guvaka*, *tvak* and *khatika choorna* have *madhura rasa*. So majority of the drugs are here with *katu, tiktha, kashaya* or *madhura rasa*. These are the rasas indicated for *dantadhavana* by our *Acharyas*. *Madhura rasa* is additionally added by *Acharya Susrutha* and *Bhavaprakasa*. *Katu rasais* *ruchya*, *sodhana*, *kledaupasoshana* (dries up *kleda*), opens up the metabolic pathways pacifies *kapha*, *vaktramsodayathi* (it keep the mouth clean). *Mukhavaisadyakara* ie. cleansing the oral cavity. Even though *tiktha rasa* is *arocharaka* it could reduce *arcuchi* (distaste) in the mouth. It is *krimihara*, *daha* and *trishnasamana*, *lekhana*, *kledaupasoshana*, *ruksha*, *seeta*, *kandavisodana*. *Kashayarasa* is *kledavisoshana*, *kaphasamana* and *ruksha*.

*Sunthi, haritaki, khadira, ghanasara, guvaka bhasma and tvak possess rukska guna. Marica and tvak possess tikshna guna. Devapuspa have snigdaguna. Sunthi, haritaki, marica, tvak are of ushna virya and musta, khadira, ghanasara, guvaka bhasma, devapuspa, khatika choorna are of seetavirya. So, the yoga balances in ushna and seetavirya. Considering the dosha karma, sunthi, musta, khadira, ghanasara, guvaka bhasma, marica, devapuspa have kaphahara properties. Musta, khadira, guvaka bhasma, devapuspa, khadika possess pittahara properties. Sundh and marica are vatahara. Haritaki is tridoshasamana.*

Majority of the ingredients are of *katu* (astringent) and *tikta rasa* (bitter), *laghu* (light), *rooksha* (rough) and *tikshna* (strong) *guna* (properties), *katuvipaka*; *seetavirya* (cold potency) and *kaphapittasamana karma in nature*. *Vyadhiprabhava* of some of the ingredients are very relevant in the context of *mukharoga* like *aruchi* and *krimighna*. *Sunthi, haritaki, musta, khadira, karpura, marica* possess *krimihara* properties. Some of the ingredients possess the action of *lekhana* and *sodhana* property also. These properties of *Dasanasamskara choorna* may help to decrease debris, calculus and the bacterial load.

The *katu* and *tikta rasa, laghu, ruksha* and *tikshnaguna, katu vipaka* and *kaphapitta samana karma of Dasanasamskara choorna* may be considered as the factors for reducing sinusitis. The intervention was also effective in reducing stains, halitosis, distaste and feeling of coating in the mouth. Vitiating *kapha* along with food debris causes halitosis or *dourgandhya* in oral cavity. *Kaphahara* action of the drugs and *ruchikara properties of sunthi, musta, marica, tvak, guvaka* may be considered for the positive changes in the study. The reduction in coating of mouth (*upadeha*) may be due to *laghu, ruksha* and *tikshnagunas* of the drugs. All these properties of *Dasanasamskara choorna* may be considered for significance of the study.

#### CONCLUSIONS:

1. The study drug *Dasanasamskara choorna* mentioned in *Bhaishajyaratnavali* is highly effective in improving oral hygiene. It is effective in reducing total bacteria count and *Streptococcus mutans* count.
2. The intervention is effective in reducing stains, halitosis, distaste and feeling of coating in the mouth.
3. The intervention is more effective in *kapha* predominated *prakrithi* volunteers.
4. *Dasanasamskara choorna* is highly effective in improving oral hygiene considering OHI-S score at  $p < 0.05$  level.
5. *Dasanasamskara choorna* is significantly effective in reducing total bacteria count and *Streptococcus mutans* count at  $p < 0.05$ .

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